# PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

**PCT**

To:

see form PCT/ISA/220

*26/5*

## WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

### (PCT Rule 43*bis*.1)

| | |
|---|---|
| | **Date of mailing**<br>*(day/month/year)*   see form PCT/ISA/210 (second sheet) |
| Applicant's or agent's file reference<br>see form PCT/ISA/220 | **FOR FURTHER ACTION**<br>See paragraph 2 below |

| International application No.<br>PCT/GB2004/004741 | International filing date *(day/month/year)*<br>10.11.2004 | Priority date *(day/month/year)*<br>10.11.2003 |
|---|---|---|

International Patent Classification (IPC) or both national classification and IPC
G06T5/00

Applicant
METROPOLIS DATA CONSULTANTS LIMITED

---

1.  This opinion contains indications relating to the following items:

    ☒ Box No. I      Basis of the opinion

    ☐ Box No. II     Priority

    ☐ Box No. III    Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

    ☐ Box No. IV     Lack of unity of invention

    ☒ Box No. V      Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

    ☐ Box No. VI     Certain documents cited

    ☐ Box No. VII    Certain defects in the international application

    ☐ Box No. VIII   Certain observations on the international application

2.  **FURTHER ACTION**

    If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

    If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

    For further options, see Form PCT/ISA/220.

3.  For further details, see notes to Form PCT/ISA/220.

---

| Name and mailing address of the ISA:<br><br>European Patent Office<br>D-80298 Munich<br>Tel. +49 89 2399 - 0 Tx: 523656 epmu d<br>Fax: +49 89 2399 - 4465 | Authorized Officer<br><br>Casteller, M<br><br>Telephone No. +49 89 2399-2666 |
|---|---|

---

### Box No. I    Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This opinion has been established on the basis of a translation from the original language into the following language     , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material:

      ☐   a sequence listing

      ☐   table(s) related to the sequence listing

   b. format of material:

      ☐   in written format

      ☐   in computer readable form

   c. time of filing/furnishing:

      ☐   contained in the international application as filed.

      ☐   filed together with the international application in computer readable form.

      ☐   furnished subsequently to this Authority for the purposes of search.

3. ☐   In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

**Box No. V**    Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | | |
|---|---|---|---|
| Novelty (N) | Yes: | Claims | 1-29 |
| | No: | Claims | |
| Inventive step (IS) | Yes: | Claims | 1-29 |
| | No: | Claims | |
| Industrial applicability (IA) | Yes: | Claims | 1-29 |
| | No: | Claims | |

2. Citations and explanations

   **see separate sheet**

## Re Item V
**Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1.  Reference is made to the following documents:

    D1:  HOBSON M P ET AL: "Combining cosmological data sets: hyperparameters and Bayesian evidence" MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY BLACKWELL SCIENCE FOR R. ASTRON. SOC UK, vol. 335, no. 2, 11 September 2002 (2002-09-11), pages 377-388, XP002319477 ISSN: 0035-8711

    D2:  HOBSON M P ET AL: "A Bayesian approach to discrete object detection in astronomical data sets" MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY BLACKWELL SCIENCE FOR R. ASTRON. SOC UK, vol. 338, no. 3, 21 January 2003 (2003-01-21), pages 765-784, XP002319476 ISSN: 0035-8711

2.  The document D2 discloses (the references in parentheses applying to this document): given a measured data set $D$ and admitting that the phenomenon being measured can be described by an underlying model, it is known to use Bayesian inference for estimating the values of a set of parameters $\theta$ associated to said underlying model (paragraph 2); based on Bayesian inference, it is possible to determine which one of a number of alternative models $H_0$, $H_1$ best represents a measured phenomenon by calculating the average of the (Bayesian) likelihood function $Pr(D|H_0)$ with respect to the prior $Pr(\theta)$, this latter representing knowledge or prejudice regarding possible values of the model parameters (paragraphs 2 and 2.2); calculating said likelihood function directly is computationally prohibitive, so that MSMC (Markov-Chain Monte Carlo) techniques are used to determine an appropriate set of samples that allows one to determine a local or (hopefully) global maximum of said likelihood function (paragraph 3 and 3.1).
    Document D1 is regarded as being the closest prior art to the subject-matter of claims 1, 10 and 23-26, it discloses the same subject-matter of D2 outlined above, and additionally mentions (the references in parentheses applying to this document): extending the model parameters of interest $\theta$ with hyperparameters $\alpha$ that are not present in the model a priori but allow extra freedom in the parameter estimation process (paragraph 3); the introduced hyperparameters allow to determine whether the measured data sets are or are not mutually consistent (paragraph 3.2). Said

hyperparameters of D1 are thus equivalent to the subsidiary mapping parameters **p** of the present application, cf. e.g. page 10 thereof.

3. Although the plurality of independent claims (cf. method claims 1 and 10 and apparatus claims 24 to 26) of overlapping scope renders the claims as a whole not entirely clear (contrary to Article 6 PCT), it appears that the subject-matter of claims 1, 10 and 23-26 differs from this known techniques in that:
instead of referring to models ($H_0$, $H_1$) as in D1 or D2, reference is made to "an alternative optimisation domain" (cf. e.g. claim 1, paragraph a)), by which (unclear) wording it should be understood a domain of enhancement operators that can be applied to the input signal (cf. sentence bridging pages 9 and 10 of the description).
The subject-matter of claim 1, 10 and 23-26 is therefore new (Article 33(2) PCT).

4. The problem to be solved by the present invention may be regarded as providing broadly applicable techniques that allow to choose the best possible enhancement operation when the input signal strongly correlates with noise and spurious signals (e.g. there is strong interpixel correlation).
The solution to this problem proposed in the independent claims is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:
although D1 and D2 do anticipate several elements of the claimed enhancement technique (cf. e.g. the complete equivalence between: the quality mapping function $Q(\mathbf{p})$ of the application - cf. page 12, lines 8-14 - and the likelihood function $Pr(\mathbf{D}|H_0)$ of D1 or D2; the prior $Pr(\mathbf{h}|H)$ of the present application - cf. page 12, lines 20-26 - and the prior $Pr(\theta)$ of D1 or D2; the hypothesis $H$ of the present application - cf. page 12, lines 27-30 - and the models $H_0$, $H_1$ of D1 or D2), neither D1 nor D2, nor any other available prior art document anticipates or even only suggests to consider a plurality of candidate mappings between the input signal and a plurality of possible enhancement operators in a domain of enhancement operators as claimed.
Claims 2-9, 11-22 and 27-29 are dependent directly or indirectly on claims 1, 10, 25 and 26 and as such also meet the requirements of the PCT with respect to novelty and inventive step.